

Stylops shannoni (Stylopidae, Strepsiptera): A New species for Canada, with comments on *Xenos peckii*

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ABSTRACT

The collection of a male *Stylops shannoni* Pierce and a number of stylopized bees, *Andrena hippotes* Robertson, containing both male and female strepsipterans is reported. This appears to be the first host record and the first association of males and females for this strepsipteran species. This also appears to be the first record for *S. shannoni* in Canada. In addition, a specimen of *Polistes fuscatus* stylopized by *Xenos peckii* Kirby was found in the collection of the Spencer Entomological Museum at the University of British Columbia.

INTRODUCTION

Strepsiptera is an order of peculiar parasitic insects. Taxonomically, strepsipterans have had an unsettled history, having been included in at least five different orders with a rank ranging from subfamily to full ordinal status (Bohart 1941). Strepsipterans are now usually placed in their own order, closely allied with Coleoptera (Kukalová-Peck & Lawrence 1993).

Strepsipterans are not often observed. The females of most species are neotenic and remain permanently in the host; the adult males, though free-flying, are small and short-lived. I report the collection of an adult male strepsipteran and a number of stylopized bees. In addition, I report on a stylopized specimen of paper wasp found in the Spencer Entomological Museum collection (SEMC) at the University of British Columbia.

MATERIALS AND METHODS

In early April, 2000, during an informal biodiversity survey of my yard in Richmond, British Columbia, I collected a free-flying male strepsipteran. In the same area was a flowering bush which was being visited by a number of species of Hymenoptera and Diptera. Among the Hymenoptera were bees belonging to the families Apidae, Halictidae and Andrenidae, the last being *Andrena* sp., some of which were stylopized (Fig. 1). Over the next three weeks, I monitored the bees visiting the bush. Because the neighborhood is residential, I was unable to follow the bees leaving the bush to determine the location of their nests. One bee was found under a clod of earth near the base of the bush but I could find no evidence of a nest in that area. Three of the female strepsipterans were dissected from their hosts and fixed in glutaraldehyde for electron microscopic examination. The puparium of one of the males was opened and the male removed. Several stylopized bees were coated with gold-palladium and photographed using a scanning electron microscope at 20 kV.

RESULTS

Between 9–18 April 2000, I collected 88 *Andrena* sp. in my front yard, of which 24 were parasitized. During the warmest part of the day, 1200–1400 hours, the stylopization rate of these *Andrena* sp. was about one in three. This rate dropped to about one in ten for collections before 10:00. No more free-flying males were observed after the initial

collection but several bees contained open puparia, indicating males had emerged, and three males still in their puparia were collected. The latter three specimens were in multiply styloped bees, one with a female and the other two each with a second male which had emerged prior to collection of the bee (Fig. 1c).

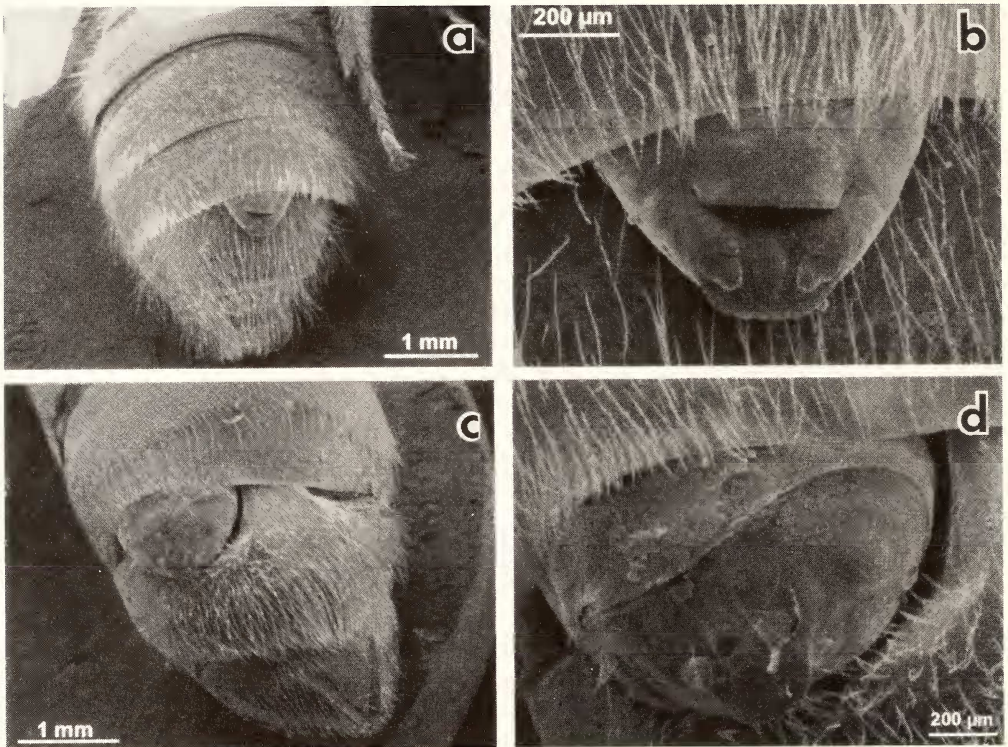


Figure 1. Scanning electron micrographs of *Andrena (Trachandrena) hippotes* Robertson styloped by *Stylops shannoni* Pierce. **a** and **b**: female *S. shannoni*; **c**: male *S. shannoni* in its puparium (left) with an open puparium (right) from which a second male had emerged prior to collection of the bee; **d**: close up of male puparium.

Using standard keys (Borror *et al.* 1989), I was able to confirm that the male strepsipterans were *Stylops* sp. as expected from the fact that they were parasitizing *Andrena* sp. Two mature males and the fixed female specimens were submitted to J. Kathirithamby who determined the males to be *Stylops shannoni* Pierce. W. E. LaBerge and R. Brooks determined the host bees to be *Andrena (Trachandrena) hippotes* Robertson. Voucher specimens of both the strepsipterans and the host bees have been deposited in the SEMC.

While collating data with respect to paper wasps in the SEMC, a styloped specimen with a locality label of Vancouver was found. It carried a female strepsipteran with its head extruded between tergites three and four.

DISCUSSION

Stylops shannoni was known previously only from a free-flying male collected on Plummer's Island, Maryland (Pierce 1918, Bohart 1941). As far as I have been able to

determine, this is the first time males and females of *S. shannoni* have been collected together and this is the first host record for this enigmatic species. Although the host species for *S. shannoni* in Maryland was not determined, *A. hippotes* is found there (LaBerge 1973). If *S. shannoni* is generally associated with *A. hippotes*, it could be found in much of North America since *A. hippotes* has a transcontinental range extending from southern British Columbia to central California on the west coast and Nova Scotia to Georgia on the east coast (LaBerge 1973).

Stylops erigeniae Pierce is known only from a female also collected on Plummer's Island (Pierce 1918). Bohart (1941) suggested that "it is probable that *shannoni* represents the male of *erigeniae*". Pierce, who was under the mistaken impression that *Stylops* spp. are strictly monospecific with respect to host species, erected a new species, *S. hippotes* Pierce, for a female stylopizing *A. hippotes* which was collected in Ohio (Pierce 1909). Bohart (1941) in his revision of North American Strepsiptera lists *S. hippotes* as a species of "uncertain position". Perhaps *S. shannoni* is the male of *S. hippotes*.

Due to the lack of distinctive morphological characters, female *Stylops* spp. are difficult to identify (Kathirithamby 1989). Added to that, the poor condition of many of Pierce's type specimens (Bohart 1941) will make resolution of these possible synonymies very difficult. Kathirithamby (personal communication) suggests that DNA analysis will be required to match males and females.

The stylopized paper wasp found in the SEMC is *Polistes fuscatus* (Fabricius). It is not *P. f. aurifer* Saussure, the subspecies which commonly occurs in BC as it has no yellow spots on tergite two. It is darker overall than typical *P. f. aurifer* even taking into account the variant formerly called *P. f. montanus* Bequaert (Bequaert 1940). The wasp keys out to *P. f. fuscatus* (Bequaert 1940, 1942). Although some records of *P. f. fuscatus* in BC have been attributed to "assisted transport" (Buckell & Spencer 1950), Leech (1966) reports the collection near Vernon in 1947 of a stylopized paper wasp which was determined as *P. f. variatus* Cresson. *Polistes f. variatus* has subsequently been synonymized with *P. f. fuscatus* (Snelling 1974). It seems unlikely that Leech's record is the result of "assisted transport".

The wasp Leech collected had two puparia projecting between tergites five and six, one laterally and one ventrally. Leech extracted the two male strepsipterans and they were determined as *Xenos peckii* Kirby (Leech 1966). One of these specimens was submitted to the SEMC in 1958 although its current location is not known. The female strepsipteran in the SEMC *P. fuscatus* specimen also appears to be *X. peckii*. The positions of the strepsipterans in both cases appear to be unusual. According to Salt & Bequaert (1929), in *Polistes* sp., male strepsiptera are usually located under tergites 3 or 4 while females are usually under tergite 5. Further, all examples cited by those authors of extrusion on the ventral surface of the wasp involve wasps with three or more parasites.

Based on the records presented here, both *Stylops shannoni* and *Xenos peckii* should be added to the Canadian and BC species lists given in Peck (1991).

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